



SOUHEGAN TECHNICAL REVIEW COMMITTEE

NH Rivers Management and Protection Program

New Hampshire Department of Environmental Services
PO Box 95 - 29 Hazen Drive - Concord, NH 03302-0095
Phone: 603-271-3548 Fax: 603-271-7894
Email: wives@des.state.nh.us

Souhegan TRC Committee Meeting Minutes

Monday, November 28, 2005

1:30 pm – 3:30 pm

Rooms 111 and 112

Members Present:

Ralph W. Abele
Douglas Bechtel
Alden Greenwood
Dr. Kenneth D. Kimball, Chair
Vernon B. Lang
John R. Nelson
Carl Paulsen
Donald L. Ware

Members Absent:

Representative Richard T. Cooney
William C. Ingham
James MacCartney
Dr. Brian R. Mrazik
Thomas Roy, Vice Chair

Others Present:

F. Vincent Gerbino	Monadnock Mountain Spring Water
Charles Santich	Pilgrim Food
Larry Anderson	Town of Milford, Water Utilities
Larry Major	Pike Industries
John Magee	NH Fish and Game
Spencer Brookes	Souhegan LAC
Rep. Judith Spang	Lamprey River Advisory Committee
Tom Ballesterio	UNH
Piotr Parasiewicz	UMA
Jeff Legros	UMA

DES Staff Present:

Paul Currier, Administrator, Watershed Management Bureau
Rick Chormann, DES, NHGS
Wayne Ives, Instream Flow Coordinator
Marie Loskamp, Executive Secretary, Watershed Management Bureau

1:30 – 1:45 Acceptance of April 1, 2005 minutes

Chair Ken Kimball opened the meeting and requested a motion to accept the minutes of the April 1, 2005 meeting.

- **Carl Paulsen made a motion to accept the minutes of the of the April 1, 2005 meeting as presented. Ralph Abele seconded the motion, there was no discussion and the vote was unanimous to accept the minutes of April 1, 2005.**

1:45 – 2:45 Review of PISF and WMP tasks – UNH Discussion

Tom Bellesaro brought three presentations, passed out handouts which have the first two presentations. Dr. Parasiewicz will give the third presentation. These presentations will be on our web site probably in about two days. Tom discussed the overview. We have the Technical Advisory and Water Management Planning

Area Committees with us today. Contractor is charged with 12 tasks and today we will be looking at Task 2 and some of the information for Task 5 which targets each community. Going through the tasks:

Task 1 – Identify these instream protected uses, the IPUOCRs.

Task 2 - At the same time, what is the groundwater component, and groundwater wells certainly are one of the many IPUOCRs.

Task 3 - Once you have all the IPUOCRs, we actually go out in the field verify them and at that same time there were habitat surveys that went on. We tried to multi-task whenever we could.

Task 4 – Prepare a report describing IPUOCRs. This report submitted over a year ago, and it can be downloaded, and you can see who these instream protected are, and we go through the whole table on which ones are flow dependent, and then we discuss these with the stakeholders and DES.

Task 5 – What are these Instream flows, what is the methodology and ultimately to propose this. PISF assessments and proposed PISF report. What is the methodology and ultimately to propose this. The methodology that we are using is MESOHabsim, MESO scale types of habitats and you define those for the different flows that occur in the river. To underscore, the way the law reads is we need to meet instream flows by flow management. There may be other scenarios in which instream flows can be met and we certainly be giving those, for example by stream restoration, instead of putting ten times more water into the river, if you would just restore certain reaches of the river you would get just as much habitat with the same flow. That is not the way the law reads. Instream flow methods as flow changes and these are in units of cubic feet/per second/per square mile, the different types of habitat change. This is not limited to just the stream itself. The Normandeau group is looking at the wet end habitat which is in the areas riparian to the river itself.

Task 6 – Once we have finished with the instream flow habitats, a report will be issued, hoping the report will be finished in January and so a target date for when we all meet and discuss, would be this coming March. Once we have all had a chance to read, digest, discuss the report, we will put all that information into the final report and then post that and that will occur after that -- March 2006.

Ken Kimball – I think that is a different date than we originally scheduled.

Wayne – Yes, I think we had some kind of a concept, was it January?

Ken – Yes, because by law this has to report back to the general court, and I wanted to know if this kept us still on that same schedule.

Wayne – I think we are okay with that. The final product, everything has to really be done, the law says we have to have a public hearing for the protected instream flow by October 2007, it also says we also need a public hearing for the water management plan by October 2007, but it also said that it said you had to the protected instream flow before you did the water management plan. So we split them up so that we are doing the PISF now and the whole thing has to end before that October 2007 date. We are still on target for that date.

Tom – I think originally over 1 ½ years ago, the proposal and interview said everything was supposed to be done by the end of December and if Mother Nature had cooperated we may have met that date.

Wayne – The timeline that we have had on there has shifted but my long term thinking is really to meet the legislative goal and not to worry too much about the internal task goals.

Ken – It might be useful to send out a revised timeline.

Wayne – I think we did put together a revised timeline for the SB330 committee. I'll check and maybe I can send out the report or link to the committee reports. All the committees, the TRC and the WMPA for both rivers submitted reports in November to the legislature, to the President to the State Committee and also the SB330. I think that information is in there, I will check and if not I will make sure that it gets sent out.

Tom - So that brings us now after task 7 that is really all on the instream flow end of the business. Once we have the instream flows then we can charge ahead into the water management strategies.

Task 8 – The assessment of water use in light of the established instream flows (PISF). We don't have the instream flows done, and we are still working on those. But what we have been doing is we use office techniques in lieu of actual field measurements. Already what we have in task 8, we know the flow scenarios we are running. The state wanted us to look at a typical low three year period, typical average three year flow period, and a typical high flow three year period for the instream flows and develop more of the problematic framework we developed a 30 year framework, everything that describes how we do the flows is going to be posed on line very soon. This is a 6 page document that identifies exactly how we came up with the flows and what they all mean. In lieu of actual field based MESOHabsim instream flows, we are using numbers (see presentation), and basically what we are supposed to be doing in line with the project is to have different locations along river system. There are different types of measures of what the instream flow should be. Again

these are office techniques. These are the kinds of scenarios we are trying to play out now until we actually have the instream flows so that we can do our thought processes on all the subsequent tasks.

Tom - So basically what you have is a stick figure of the system, and in this stick figure you have the main Souhegan River, you have the different towns along the way, and what we look at is not only the flows at each location but how much in a year water is taken out. This is how we start to develop what are possible management scenarios. After Task 8 we can start to develop what these plans are. There are three water management types of sub-plans: a conservation plan, a water use plan, and a dam management plan. The conservation plan we have met and identified most of the affective water users, we have identified how they use water and actually have a good description profile on each water user. For the water use plan we look at how they use water, the water use data, and potential modifications. Dam management is the last one. With all of these the conservation, the water use and the dam management plan are getting up close and personal with the water users because they are an important stakeholder and the management plan is not going to work unless everyone is on board with it. So with dam management, there is a seductive amount of storage in this watershed already. It is flood control storage, so it is typically left vacant. With some very simple modifications in a hand full of reservoirs there may be an ample supply of stored water that could be in the system such that people when the instream flows occur don't have to just shut off. There actually are some positive means in this watershed. All the dams that I am talking about now are completely uncontrolled. All the ones I have been mentioning are completely uncontrolled, there are no operators, there is no setting of flash boards, and so my point was that with simple modifications. Throughout the watershed most dams are not registered because they fall under this dam registration size. Most of the dams in which we have a lot of storage in this watershed are unregistered for the purposes of this study, all the flood control reservoirs that exist throughout the watershed.

Task 10 - Target date of late June 2006 to be able to present something that we could actually discuss, and this is where we are all going to roll up our sleeves. At this point I am not going to say that we are going to pick up everything. We are going to think of the most logical ones. We have to debate those internally, and there may be sequence of events that have to happen when we present them, some of you may ask a question, *why didn't you do this?* It may be a long involved answer that we did that but it resulted in improvements in the instream habitat or the instream flows, or it may be something we didn't think of. Once we get through that, we have task 11.

Task 11 - Public hearing where we can do it in a more public forum and then we publish that. To date we have had one WMPAAC meeting and to date we have had 3 official TRC meetings. We have also had two sub-committee meetings on the target fish community. If you look at the end of the IPUOCR report you can see all the emails and notes that they have received along the way.

Carl - Tom, in respect to what you are going to present especially related to other non-withdrawal related management techniques will there be enough information? It seems to me the structure of a process could recognize that as a valid approach like let's say restoring a reach of the river. If doing that meant that the protected flow would adjust by a particular amount that would then allow users to continue to withdraw without modifying their behavior that seems like that would be, sought of could come out of this process even though it doesn't explicitly say that. So is there going to be enough information that this could be examined in more depth or as a piece under the management plan?

Tom - I wouldn't say more in depths. Basically what comes out of the MESOHabsim analyses is how much gain you get by having more water or more depth of water. There may be reaches downstream where adding flow, tripling the flow only increases the stage, and that is not going to get you anything more downstream and so that is the true synthesis and I am not going to say that we will have it in detail, but we can identify reaches where stream restoration may be a better technique than others.

Groundwater

Tom - I am going to move into groundwater. This is the third time we have talked about

Task 2 and what task 2 is trying to decipher is the relationship between pumping groundwater out of wells and whether or not some of that water came from rivers and it is mandated that that occurs with wells within 500 feet of the designated recharge tributaries. We first relied on analytical techniques, these were the basis of the first two presentations and last summer we actually did field monitoring. Why we did that is the analytical technique is me sitting in an office and coming up with a number, and obviously a lot of you would believe, well how good is that number, and so even though the techniques are pretty good you have to make a lot of assumptions in order to employ them and going out into the field was the true verification of whether or not that analytical technique was good or not.

Tom gave an example and showed it through a Powerpoint presentation. How much of well water came from the river showing the well head area. Used steady state and groundwater models got the same answer both based on presumptions and estimates. Well is pumping groundwater out of top, cone of depression, groundwater would have slowly gone down into the river. In Milford the river is a losing river and there are a lot of wells pumping water, where the river comes from high ground. If you pump more water the cone of depression would increase. Stagnation point is pretty important, on one side of the stagnation point water goes to the well and on one side of the stagnation point water goes to the river. If this were the case for a well it is not inducing or taking water directly from the river.

Field techniques – pumping tests, monitoring miniature piezometers, seepage flux meters and tracer tests and we went with miniature piezometers. From the well go to the closest distance to the river, install miniature piezometers and find ambient condition. Water level in these wells would slope downstream and the largest amount of effect is induced recharge. They monitored three sites which showed induced recharge and another one with no induced recharge. This is one measure that you are at an ambient condition. Horizontal groundwater slope USGS maps; max vertical ground water slope (field), upstream distance to ambient slope; difficult to pull up 2 feet. Need to go 400 feet upstream to get to the ambient condition and then 800 feet downstream.

Blessed with normal amount of rain fall a lot of our surface water bodies, both ponds and streams are locations that collect groundwater, at high stages you definitely would see the reverse. We don't typically see negative gradients in NH. For more detail see Tom's presentation on our web site.

Ken – We are using a distance of 500 feet is that really adequate for this analysis or do you feel it capturing most of what needs to be captured based on this river.

Tom – I think it is site specific. 500 feet may be small if you are trying to adjust a well that is pumping 2,000 gallons per minutes. 100 feet may be large if you are looking at a well that is only pumping 20 gallons per minute. In my opinion homeowner wells you can probably say very, very few.

Ken – The question I am really asking is based on your analysis of the Souhegan and forgetting the rest of state right now, is 500 close enough to capture what we need to capture.

Tom – It probably has captured the vast majority there might be a few that slip through the cracks.

Ken – It is one thing if you are missing one or two small ones and it is another thing if you are missing a couple of big ones.

Tom – The beauty of the state database is you can query it, all the users in the watershed, and you certainly look at the big ones and perform a similar analysis.

Ken – It would seem to me that if you were looking at the underlying geology and you are looking at the state database and saw something that was 700 feet out but it had the potential to be really serious, I would hope at least there would be a parallel analysis that would be inserted in so that we understand that. Because otherwise what is really happening is every other water user is being penalized.

Tom – We did look at some wells that were far away and there were reasons why we did that because they were large, they might have impaired with another and a lot of our analytical techniques were really looking at wells when no one else was around. Where we thought it was justified, we did that. In some of the cases it didn't come out.

Wayne - We lump everything by facility not by individual well so if you have a facility that has two wells and one is outside of 500 feet that whole system is applied.

Tom – It would appear that in most of these system where there is more than one well, there is the possibility when there is induced recharge to do a trade off, start pumping more from the other well and less from this one and the reason why we know that is we have the historical amounts that each well has pumped in the past and we know that those wells can increase by that amount and they certainly can reduce.

Ken – Going back to this issue of 500 feet, this is a pilot program as well as the Lamprey, there will be a chance I think go back and look at rewriting what these distances are. If I am correct when a river is actually designated, it is back 1200 plus feet, which is a ¼ of a mile. I would hope or ask, whatever, that as you are finishing this off you might make a recommendation as to where to set that number realizing that 500 may not be the best number.

Tom – Maybe fortunately I wasn't part of the political process before but realistically if it is in the watershed, we probably should be looking at it. I think that at the outset many entities might have been fearful that it might have included too much or for whatever reason the reality is it is a watershed and we are looking at surface and ground water as a connective research.

Ken - I don't disagree there, I think there is the political reality that when we get down to thinking protected instream flow there has to be a mechanism that is simple enough to apply and not so over analytical that no one can use it.

Wayne – I will take the blame for the 500 foot that is in the Rules and not the Legislation. The legislators didn't do that, the Department did that.

Tom – I think that it did capture the lions share.

Wayne – At the time it was a simplification because we didn't know we were going to do this process and we thought in order to make this easier, we would only include people within 500, and then we decided well we might as well take this on ourselves as a task to assess the actual reduce recharge and see if people are so far away they do not have any impact. It was based on people's background in geology to say large groundwater withdrawals of sand and gravel system, we might have an impact not for 1000 feet or more but it is not going to be a very big impact.

Carl – There was a working group of hydrologist and others that sat down and talked about it and tried to come up with some number.

Paul Currier – Actually the original proposal was a well within 250 feet would be presumed to have all of its pumped water drawn directly from the river, and the compromised position was to do this kind of an analysis but expand the view of the analysis to 500 feet.

Wayne – So the answer then is that there are three wells that are strongly influencing the flow in the rivers and the rest of them have less of an impact directly.

Tom – Three well showed induced recharge that we will try to include in development of water management plans. Again if it is as simple as this well is inducing 500 gallons per minute, is there some way to increase the flow of another well and reduce this one, that is one management strategy that really has a very low cost consequence and yet may be a big impact and it seems to well within the grass roots systems that have multiple wells.

Wayne – The other wells have some impact on flow but they are not an immediate impact.

Tom - Bedrock we just don't have the information, we don't have USGS studies, it is rare when you have knowledge of where that bedrock groundwater is going let alone whether it was actually directed or connected into the river. We do know from our studies at Pease that we can find bedrock out crops on the Great Bay where groundwater is coming out of that bedrock. We have done the testing and we can figure out how much of that seep is bedrock versus groundwater but for rivers we don't have that information. Fortunately in this river system you don't have a lot of large groundwater withdrawals from bedrock wells.

Paul – The mini piezometers would work whether the water was bedrock or not.

Tom – Yes, they tell you what is happening right at the riverbed.

2:15 – 2:45 Review of Draft Final Target Fish Community – UNH presentation and Questions - Piotr Parasiewicz

Piotr – My part here is to talk about at least a portion of Task 5. We are in a process of data collection and processing the data. In terms of data collection for the fish habitat analysis we have 99% of data in box and only 1 survey left. Focus more on the task that is almost completed or actually is completed which we decided to move forward beyond original ideas and original scope. This task was to develop a target fish community for the Souhegan River in the study area. The purpose of developing a target fish community is to establish a baseline, a bench mark of the fauna composition in the river. As originally defined target fish community is a fauna that managers, the people living in area would wish for to have in the stream. Basically this is what we would be happy with if our rivers could have this type of a community and it is strongly based on natural fauna composition on the ecological settings and it does not include exotic species, or introduced species. This process has just been developed and been adopted into Maine and Massachusetts state law and consists of 2 basic steps. 1st is to establish a list of species that you would expect in the river and 2nd is to tell something about the dominant structure, which species would be more common and which would be less common, species composition in terms of gills and specifically for rivers we are trying to analyze if the river community is dominated by river or pond fish. Problem if you have pond fish in the river instead of stream fish.

We are in the process of developing the target fish community and I would like to introduce Jeff Legros who is at University of Massachusetts who is responsible for most of the calculation. He may answer some detailed questions. One thing we have to bring up front is that while developing target fish community; to develop this list and to develop fish community structure, you use historical fish data as well as river types.

Here what we realized on the Souhegan River that we should deal with two different target fish communities because the river is so different. We have portion of river in our study area that is much higher gradient, that is flowing within the mountains and then goes into flats and it is what David Neils calls *turns into a slow winder*, where the river really winds slowly between deep pools and runs rather than the riffle type of habitat. So obviously this was the reason to break it up into two communities. As elevation of river bed changes while it goes downstream it is also changing the stream order which is a measure of river development as you go down stream. Another reason for dividing into two target fish communities was that one of metrics used in development of this model is ecoregion, as defined by the Omernik. The Souhegan lies between two ecoregions so it is an indication, it is not approved that it would be a reason because we do not believe that there is a border line and they have to have a passport to go from the lower to the upper Souhegan River. It could be an interesting feature and have some influence on composition of the fauna. We developed two different models one for the upper portion that goes from the top of study area to the area of Wilton to the confluence of Stony Brook and then a second one for rest of the Souhegan River. The first step is to identify fish data that can be used for development of target fish communities and the first step of this is to find rivers that are similar to Souhegan. We are using GIS modeling tools to implement several filters that first allow us to select the streams based on the drainage area, stream or gradient class, elevation class and percent of geology. We apply this field data to the GIS database of rivers that has been developed by the Nature Conservancy where we have all this information on one database and make everything easy. Jeff was fighting with this for a few months. Then the next step is once we have identified these physically similar rivers is to apply that ecoregion on top of it, and then eventually you end up with a selection of streams that correspond with the reference for the Souhegan. The physical attributes that are applied two for both models so looking for rivers similar to the Upper Souhegan we look for rivers that have a drainage area of 80 to 170 miles. Streams that are similar to the Upper Souhegan River we see reference rivers in Berkshires in MA, Piscataquog River. We receive data from MA and NH Fish and Wildlife and the same thing for lower Souhegan River. Fish data as it has been organized in all developed target fish communities.

There are 17 species on Lower Souhegan instead of the 18 species on the Upper Souhegan. This may have something to do with the ecoregion. A lot of fish are pond fish, larger fish dominating upper portion of Souhegan.

Vern Lang – The way you referenced that as 75% fluvial specialist, I think you should broaden that to say it is fluvial dependent.

Piotr – That is correct, but then always together fluvial specialist/dependent.

Alden Greenwood – There are many trout that are put in that river in Greenville every July.

Piotr – That is what I mentioned before. When we develop target fish community we exclude exotic specials. Trout is a domestic fish it has been put in my man. So in our analysis on the target fish community level, we basically ignore all non-native species. We accept the fact that they are there, and the target fish community is being developed with the data that has this number, but the final result basically ignores them.

Carl Paulsen – In the context of the flow rules themselves, one of the resources that is intended to be protected is recreation and if there is a recreational fishery for trout that is stocked and it is important, should that be factored in? I am not suggesting that I think it should or not, but specifically if a recreation activity that you are trying to protect is trout fishing, then how would you account for it in this process?

Piotr – That is a completely different ball of wax. We are at the moment developing a target, a baseline that should tell us what the river should look like and the philosophy here is when the native species are doing well there is no reason to believe that the exotic species will not only do well but even better so we are not hurting exotics.

Carl - Trout is a species that seems like it would be a fairly sensitive species if you were trying to manage for it, and it seems to me even though you are looking at the aquatic biology of river but if one of the things you are trying to protect is recreational fishing for trout, and in order to manage for them you have to know this same information, it seems like you would to try to understand the habitat parameters to support that in your decision.

Paul – A seat of the pants answer there is a general presumption that the habitat conditions that will support a natural reproducing population will support the introduced species for put and paid fish long enough to be caught.

Piotr – Another thing if you would apply this strategy then you would potentially want to develop a river that is a slow winding, warm water river into a trout river, you don't want to develop a Disneyland here. It

is something that comes at end of this process, at the management process. Not at the process where we try to establish the instream flows that are necessary to protect the river, and I consider the fauna and the fauna composition being a part of the river.

Ken – It may be incorrect but some of the cold water fisheries that are put in for sport fisheries are essentially put in for just certain seasons because of the temperature issues which typically also tend to be the higher flow.

Piotr – This is what we would like to have and then this is what we found. Fish we caught in the Upper Souhegan last summer. Piotr showed chart of proportions of different species, the target fish community, a big part of the species that should be dominating are dominating; however, there are fewer of them than we should have there are only 9. Many of species are missing, really cold water fish. Brook trout are in low numbers, the same story. This gives us something to think about also is the fish density that we had in this stream. In 128 grids we caught 500+ fish which is low. The last time I had such numbers was on the Quinebaug. For a comparison a river in Connecticut which is much more productive has 2 fish per sq meter; so we have 10 ½ a little more than ½ of a fish and .8 fish per sq meter here. The Lower Souhegan also only about 8 or 9 species only relatively low densities, here again we used not only collector fishing grids, but Jeff had the pleasure of snorkeling around and writing down every fish he saw, so here again there are some things that are beginning to be apparent and we apparently have larger portions of pond fish.

Doug Bechtel - In the *portion existing bar* you are not ignoring introduced species here correct?

Piotr – No, this is ignoring, this is the same also. We compared how this would like if we included exotic species, brown trout and rainbow trout, and they are about 2% of the population. The trout are in the fluvial area. Summary – We have a lower number of species compared to the target; we have low species density; we obviously have some cold water species missing; and proportions of fluvial specialist/fluvial dependent vs. general species is similar. The river is flowing.

John Nelson – Piotr, going back to the model, how you developed the target fish community and the rivers that you examined, did you factor in the extent to which those other rivers were impaired in some way and the numbers from those rivers were not representative of the target fish community for that river..

Piotr – Excellent question, yes one of the parts of the filtering process of the rivers is to remove all of those rivers that are obviously impacted. So at the end once we have just 20 rivers then we go to people who know the streams and talk to them, what do you know about the stream, is it in the middle of a town, is it completely modified and if this is the case we just throw it out.

Tom - You can refer to table 2 in the report, it gives a general reason for the ones that were not selected and the reason why they were rejected.

Ralph Abele – What also done, may be inferred, there has been a tremendous amount of dialog between these two people and the people who have been out on the rivers for years and years, from DES and from Fish and Game, and people from Massachusetts, Fisheries and Wildlife, who have done this work in Massachusetts have come up. We may even have the zip codes of the fish but we are pretty close, they might have had a phone number in some cases. They knew the rivers, you can set all these sought of quantitative things about slope and all but people also knew here is something about the rivers too.

Piotr – Here is a little side step while we are talking about the conclusions and Tom mentioned already he ruined my point here that we had really high water temperatures. This is the flow right below Greenville, a temperature probe that was located this summer and was recording data all the time. For most of July and August the temperatures were about 25 Celsius. If I was a trout, I would not like it. It is hot and it is going up almost 30 degrees. Another thing that is very interesting, the temperatures that we measured last year on the Souhegan River along the stream with multiple probes, it is something that is fascinating here because we have this reverse pattern that I have seen also on the Quinebaug. The river on the top is warmer, or almost as warm as at the bottom. We have this kind of neat situation and of course we were very curious why this is happening, and I asked Jeff to go to the stream and check out impoundments in summer. So we had a solar panel sitting right on top of the watershed that provides a really good bath tub for all kinds of sun fish and all kind of fish that like it warm. It does not make trout happy and there could be a simple explanation why we didn't found a single slimy scalpin although we would expect them here while we barely found any brook trout, we found some salmon but not many. This is one of the many surprises that I am always having when I work on the rivers.

Alden – And that is before Greenville?

Piotr – No it is right downstream of the reservoir.

Ken - How much does groundwater withdrawal affect your temperatures because there is quantity of water that the groundwater withdrawals are affecting, you are probably also pulling out cooler water that would be coming into the stream.

Piotr – This could easily be a factor in some areas but I don't think that it is a factor that has an impact on the entire watershed.

Tom – Not at the flows that we are talking about, we really haven't hit an extreme number of flows yet. So maybe at the lowest of low flows because now all the withdrawals, whether to groundwater or not, shouldn't affect temperature.

Ken – So in some cases it could be but in this particular river it probably is not.

Tom – It doesn't look like that is shaping temperature.

Piotr – It looks like we have a much bigger problem than that which could be mitigated even with our problem.

Alden – Just about all the storage in the river is in the upper Souhegan. In July there is just no problem. In July and August there is just no water coming out of that river.

Piotr – Yes but this water is warm.

Alden – It is very warm it just sits there and gets warm. Do you think it is a natural thing?

Piotr – That is an excellent question, some people would mention well maybe this river was always so warm, we had all these beavers running around and building small impoundment and they were warming up and so on. We don't have a study that would document the difference between beaver impoundments that are built out of logs and seepage leaking all over which is probably in the middle of the woods and covered, versus one that is really solid, with the grass mowed all over, relatively big and is releasing water right from the

Alden – Just about every pond up above there are in Massachusetts. The river starts in Massachusetts. All ponds were there, ponds that have been there for years and years and eventually they were dammed up with a concreted dam.

Piotr – As an engineer I believe that there are methods to make these ponds useable for flow augmentation and releasing colder water. You could introduce vegetation and you could create swamps instead of having ponds.

Next Steps – Get the final approval of Target Fish Community (TFC), we believe that we are close, establish final approval of Target Fish Community. Now we would like to introduce as a new task new approach, the question that came up what should we do with the species that are under represented or not represented in the river any more. Should we ignore them, say well bad luck or we should try to estimate, or in other words shouldn't we try to develop not only a target but establish a reference community. There are some reasons for developing this target. If we want to establish the habit of conditions that are relative and natural and good for the river we need to take into account the species that were using this habitats. We use here a reference as a template that will tell us how this habitat structure should have looked like. We had this conversation and we decided that yes this is worthwhile doing it. One of methods we could agree on was that we could rank those species; Atlantic salmon should be the third dominate species, brook trout or slimy sculpin 5th or 7th. There is a question of American shad and blue back herring and there is an interesting conversation about wildcat falls as they are not possible for shad and blue back herring and Normandeau biologist said no way. We asked Alex Hiro in Turners Falls and he said I don't know, maybe so we are back to square one here. So we will consider this and then the next step is we will want to develop this fish/habitat ratio, finalize the habitat model and identify habitat deficits and measurements. We did not find any slimy here.

Reference fish Community – What would be the main purpose. We would to deal with American eel, Atlantic salmon, brook trout and slimy sculpin or other species and try to determine if their ranking is correct, move to the place we believe they should be, and this would be something that we call reference fish community applied to the same model. Now the use of it is that if we have reference that the proportions of the species in the reference fish community, and can also compare to a fish catch, but we also can analyze if we have habitat for these. If there was enough habitat to support these fish, in one example we could pretty quickly figure out that there is not much habitat to support brook trout. There are habitat conditions in the river at different flows. If I increase the flow would there be enough habitat conditions for brook trout, would the habitat increase also?

Having this information is going to draw our attention right away to missing habitat for brook trout, we don't have many brook trout, we should have more brook trout, why? So we went to our model and analyzed which would be the area that could have a high probability of presence of brook trout. This would be riffles, runs, pools, and glides; and then try to figure out what were the reasons that other riffles, runs and pools did not

have brook trout and then we found out what parameters were missing and then concluded that in order to improve this river we would need to make this habitat suitable for brook trout we would need to add boulders and shade. This is why we need a reference fish community to be able to see what the measures are that could be implemented to bring the river closer to what it should be. Within our models in this example the amount of wooded debris and shading, we simulated what would happen on a site that didn't have any habitat for brook trout originally, so basically had zero habitat and once we added the wooded debris and boulders and changed its parameters all of a sudden it showed up that we can have more brook trout.

Wayne – The reason why there is no brook trout in the Target fish community which is the information that is coming from all of these Reference Rivers is because we are looking at American eel, salmon and brook trout being missing from those reference rivers for some reason.

Piotr – The reason for American eel and salmon, the answer is pretty easy why. American eels the reason for the numbers being low is because of the dams. Brook trout, similar story, because we know pretty well already that region wide we have brook trout deficits for reasons just shown, not enough wooded debris, modified flows in the streams. So overall we should have landscape level modification of all the highest quality streams that we have.

Wayne – So even the rivers that are not considered impaired at this point are sought of impaired region wide. So we are missing some of these species in the best rivers.

Piotr - Big trees that were there before in this landscape are not there any more. Many reasons that are associated with human activities that even what we are getting now of the targeted fish community is still impacted. If I want to restore the river to a functional shape, I need to take this into account.

Ken – So you are suggesting that if there is an impact, someone withdrawing water will be allowed to continue?

Possibly this would be a way to negotiation for a tradeoff.

Tom – Putting on a black hat, if I were withdrawing water and the real issue isn't the amount of water in there but the quality of the water and my withdrawal has nothing to do with the quality, I don't know that a management strategy is going to be fair to target one withdrawer to remediate something that isn't being caused by the withdrawer. That is if warm water temperatures are being caused by a completely different reason, whether or not this person is withdrawing water as a management strategy to say that one user has to fix the problem, I don't know if that is fair.

Ken – No what I was going back to is a couple of slides back he was demonstrating that if you increase the flow you didn't get any habitat, that if you added wooded debris and boulders that would increase flow essentially then the water quantity actually becomes a limiting factor.

Wayne – I think this may end up in the final product after the pilot program is done. What we are looking at first is flow recommendations, what we tagged onto this process is an intimation that there are other things in flow that are important here and we may need to suggest changes to the legislation and recognize that so that there can be other alternatives other than flow management. The situation here may be that no matter what flow management we do, we don't really have a significant impact or improvement. There are other things that you can do with less effort. That is the kind of thing that eventually we will get to that point. Under this process we are in pilot program dealing with flow management and we have to manage it in that way. Eventually we can get maybe to the point where we manage things with additional alternatives, but we are somewhat limited under this process.

Piotr – The other way of explaining this is that what we need to remember if you have a square conduit you can put as much water as you want.

Ken – I was thinking more in terms of where is DES is headed right now with Wetland mitigation where currently there are dollars that are spent on lots of wetland mitigation that don't do much and now they are talking about pooling the resources to see whether or not you cannot do something that is a little bit more beneficial and there is a question as to whether that concept could be applied here as well.

Tom – It is not a stretch that some stream restoration measures may actually enhance a lot of different of recreation and not just fishing

Question: I am just reacting to Shoreland Protection and I know that is not here too, but also the shading of rivers and so forth and what would the tributaries to this river are not affected by the shoreland.

Question: One of the key factors that had contributed to higher temperature of water on Souhegan is that a trend?

Piotr - I believe from what I have seen up to know, we have reason to believe that these other shallow flood protection reserve waters in the tributaries on the top of the watershed, they are just in the wrong place. From the flood protection standpoint they are probably in the right place, from our standpoint they are just warming up water temperature in the wrong spot and I am not saying that we would have to get rid of them, but there are ways to mitigate for impact.

Mr. Gerbino – Our property Monadnock Spring Water just above Milford and behind the plant is very much intact. We have some obviously big sycamore trees, very shaded and there are a lot of trout in there. What species am I seeing? Some of them from stock fishing I guess as they are really big ones.

Piotr - We know this area pretty well, because we have fished it pretty intensively and you should not be misled by occasional observations, the systematic sampling tells you really what is going on and so if you occasionally see fish it might now mean a lot.

Mr. Gerbino – Right, I am curious as to how it has changed over last few years. About 4 years ago when we had the night shift running, the guys fished on their lunch break and caught fish every day.

Piotr – I don't know the answer to that. We are not saying that there is no fish in the river. There is and we found various proportions. It is not in a density that we would expect for a river like this and it doesn't have the species composition that we would expect. A lot of the fish might be very well stocked fish.

Tom – When we are looking here and looking at this we are dealing solely with brook trout because that is the native species that is there. Most of the larger trout are stocked fish that are being caught.

Mr. Gerbino – A majority of the property that we own is on both sides of the river and is undeveloped and in the interest of keeping our business running it is our mission to keep it that way. Our mission in our participation is to maintain the surrounding ecosystem the way it is around Monadnock Springs.

Piotr - Along the stream, downstream of Greenville all the way to Monadnock Spring, the river is running through the forest and there is one road next to it, not a high population area. The warm water comes from the top so the water is warm already when it comes there. Shading at the headwaters at the ponds and I have seen pictures of these ponds and they are basically open solar panels. They are all shallow and wide and the grass is mowed. We measured the temperature at 84 degrees flowing out of the thing. So far this is the most apparent thing that could be causing these problems.

Mr. Gerbino - Greenville waste treatment treats and discharges into the Souhegan.

Piotr - We didn't look into this. We have mapped temperatures in Milford. Temperature measurements directly under the discharge and it is very little higher. It wouldn't be much of an impact I don't believe. We didn't measure directly on the Greenfield facility but in Milford it is very interesting actually under waste water treatment plant the temperature is lower and it is different in winter.

Question: There is a potential that these impoundments that are upstream may be more detrimental to the habitat and people who are drawing out of the Souhegan downstream?

Piotr – Yes there is potential.

Follow up Question: Are any of those dam owners are they registered dam owners also?

Piotr – I don't think so, no. This is purely flood protection.

Wayne- Registered water users are generally only Hydro power, otherwise you are not really using the water in the same sense as required for registration you would be an affected dam owner potentially.

Tom -Water users may want to get together and say there would be a better way to spend our resources by addressing the dam issue.

Paul - Temperature in WQ standard is an independent parameter. It is not usually one of the parameters that we consider when we are talking about flow and the related fish habitat issues but it is a very valid issue if you are looking at a target fish community and you want to know how the existing community relates with temperature requirements for the target fish community would definitely be a consideration but it is separate in the standards so it is something that we have to think about.

Piotr – It was not in our mandate. This is just because I am sticking a thermometer in whatever river I am working on.

Alden – Does the type of fish and the amount of fish vary with season and temperature?

Piotr – Yes.

Alden – So in other words you took this data in July and August.

Piotr – We were fishing in July and August.

Alden – Have you fished in winter through the ice, would you get some other data by doing this?

Piotr – The thing that would change is that in summer you have much more juvenile fish that were just produced. Data could increase to some extent.

Tom – It is different.

Piotr - Because it depends on the data and from the data from the other rivers that we are getting. Most of the fish data are collected within the summer so we are comparing apples to apples. The major change in the community would be by massive migration of Atlantic salmon to the stream where you would have a temporary shift. That is not the case here. It is not that all the brook trout will die over winter and will back here in the spring in two years.

Tom – And the other issue is that the low flow times are typically July, August and September. So if you are looking at instream flows and trying to augment flows then it would be in one of those months. There might be a need for more water in winter too and we are not saying anything about the fact that the winter might be a limiting factor to densities to some extent; it is very possible that there is not enough water for winter habitat and in many cases this may be a limiting factor. We do not have the data or the resources but in the future we will try to analyze flows as they were in winter.

Ken – Moving up to the 36,000 foot level as opposed to just on the Souhegan, the state has essentially picked to try this method on two different rivers and it is a pilot program. From my observation it does not matter whether it was US Fish and Wildlife services in term ABF method, tenant method on down the list to IFIM, they all get challenged some where along the line. Now that you have gotten into two rivers in the state, and this potentially could be the method that the state picks, what do you see is its biggest weakness and how would you see that would be dealt with, only in that there is going to be disgruntled entity someplace along the line. They are going to look for the weak links in this method as they would look in the weak links of any methods and they are going to challenge it. Where do you think that weak link is from your perspective and how defensible your strategy is going to be against that?

Tom – It is appropriate to ask this question, a lot of the fish data we have is warm water fish data, we can guess what happens in January and February, but in reality this is what we have and what we are trying to match. As far as a weakness, looking at study, gathering a lot of field data, we are getting up close and personal with river, have good estimates of habitat, good data who is there and how they would like it if they were there. Weakness, one is reasonable reference fish community, look at thousands of river reaches, not robust enough, what looks good isn't too far from what should be there as a strength modeling technique we have the way it should be, now flow, the temperature, the wooded debris, pools, stepped pool sequence, we know that there are non flow types of issues, we can come up with hard numbers and this is what you can do without just changing flow.

Piotr is data at the right times? Area photography, with our growing database, we will be able to develop algorithms on how we address this issue. Most limiting factor is collecting all the data, we still have one flow to catch, and we have to be ready to go when the right flow occurs. The database will be able to address it.

Habitat map – we are already processing models of habitat suitability in different flow conditions, some examples, nothing to quote, still preliminary. Working with a high level of detail, learning we could drop a lot of detail and still come up with the same conclusion, same results. Good thing what we are providing is a defensible technique and now we have data that will document it.

Something developed very recently, haven't shown to this community yet, on web there is a dynamic digital map, digital photo album, see on rivers that we are working on. Obtain all information for daily average temperatures, reference fish community. How many square miles, zone into specific areas and consider what locations we have talked about and go to one of our study sites. Filter you can set up to see immediately maps that have been developed for every different flow in this area. See right away pictures of the area. This turned out to be useful. Have bells and whistles where you can fly through the watershed. UMass home page.

Home page is ddm-souhegan. – on homepage on Souhegan project. We will get all gauge information collected and plugged in, maps and then models, run models with modified parameters. Done.

Vern – Over several years worked on target fish community reports and one question that pops up is top predator, we seem to be lacking a clearly defined predator, if you have seen target fish community in NE that has predator in top five species. Brook trout is top level predator in that system. Curious if you have seen a way through that. Do you see the reference community is a way to get at that?

Piotr – In Connecticut eel and salmon are predominate predators, more coastal. Discussion with Mark within food chain top predator does not have to be most dominating species, don't know for sure top

predictor should be number 1 or 3 fish. Such a level of detail on Souhegan on other rivers, it is not about having less brook trout, there is almost none. Caught less than 10, they are gone, not there, few individuals.

Vern – There is another point that you mentioned here, the ponds being in the upper part of watershed playing a significant role in shaping the community, because of the temperature issue. A number of years ago we were working in Rhode Island on a reservoir project, and had a similar situation where upper parts of watershed, the streams all filled up ponds, where they are all surface discharges but as you went downstream say a ½ mile things began to change fairly dramatically, and what we found was that initially in tributary streams that came into the main stem and then gradually the main stem took on coldwater characteristic, because the groundwater inputs played a dynamic role in the system. I am curious if it had been possible that a similar situation could have existed here before man came in and put dams on these natural ponds, etc., etc.

Piotr – It is very likely and it is probably also very individual, if you have a gaining stream, several ponds at top of watershed, if you are getting a solid groundwater input those impounds would be a problem, it is the way they have been created and managed here that cause the problem.

Vern – In addition to induced discharge if your management still had people taking groundwater, without being able to do the analysis to determine if that simply flows along beside the river or flows into the river then it influences the temperature regime, it becomes much more problematic here to come up with the cause and effect relationship that may actually be occurring in the river.

Wayne – Everything is tied to the river and the river is tied to everything, unfortunately we cannot separate out all the factors.

Ken – This afternoon this discussion has been very fish centered. While the IPUOCR list obviously has far more than fish on it. Can you give us a quick summary of where those other pieces are and how they fit in the IPUOCR list?

Tom – Well the IPUOCR list had everything from recreation, hydro power, fish, water users, mussels, and it is an enormous table, and what we have tried to do for each one, and the first is a litmus test question, is it flood dependent or not. Once we answered yes, then if yes what kind of flow dependency is it. Some are actually high flow dependent, and on the low end when we identified like fish today, what is flow they need to be viable, hydropower are not generating at low flow, flow generate for a few hours and then refill, fishing, etc. Habitat goes back to what is the most flow sensitive.

Ken - There is low flow issue but there is also the natural hydrograph versus the life cycle and my sense is that a lot of this analysis gets the low flow question. I wasn't quite picking up the question of trying to mimic the natural hydrograph relative to trying to provide a lot of the other IPUOCR values which would probably come off mimicking the natural hydrograph.

Tom - On hydrograph specifically what we have done is we were blessed in having a USGS gage all the way down the stream, and over the last 15 months what we did was pick out a dozen locations along the river and we would take contrary flows and so we knew what the flow was at the gage, we would stay away usually two to three days after and so basically you are going to have a base flow occurring in the system so you could correlate the flow. From that we tried statistical relationships, so that if we know the flow at gage, we can get the flow anywhere else in the system, 30 year data all came from the records our mimicking all the information, there are human influences. Dr. Jacobs is trying to pull out withdrawals and trying to account for return flows. It is not showing to be that significant. If anything we have seen a dramatic statistically significant change in the one day low flow and the 3 day low flow. On the Merrimack we saw one day, 3 day and 7 day. The one day are decreasing, reforestation has been occurring, human related influences of withdrawal and return flows, pulled those out of record, don't seem to out way the change to the whole watershed has seen with reforestation.

There are like 6 seasons and each season will get a suit of indicator organisms that will tell us not only how much flow but also something about duration and the frequencies of specific events. The amount of storage that is there probably isn't goof for much higher than the 20 year flow. So you are not going to take care of Noah even with a 100 year flow. But that amount of storage if some of it was dedicated to just being filled that in the event you could release in low flow times is there. You have imperfect knowledge of the future put water away for low flows in July and August.

Paul Currier – WQS have lots and lots of specification for DO and toxic chemicals, pH, temperature, and pollutants and they are done every two years. All those things are taken into account, and they are taken into account one by one and flow is one of those.

Judith Spang - If there is a new withdrawal that would bring down the water level to a certain extent, we would be able to say if that was satisfactory or not.

Paul Currier – In advance of it being there? Well the answer is that would be considered. Generally for example for dissolved oxygen the way we would do it is we would use the 7Q10 flow at 25 degrees centigrade and we would model it. That is far more restrictive than the flow regimes that we are talking about here and are generally applied when those parameters are most likely to be the problem.

Piotr - We know much more about chemistry than we do about fish behavior or target habitat needs. That is why this team is not dealing with it because there are so many people working on the water chemistry and even for the Souhegan from just what I have seen before when we were scanning through the data there was a lot of information, much more information than compared to everything else.

Tom – I think your point is well taken and to follow up on what Paul just said, if you look at table I showed under task 8, I showed you the different office methods, and 7Q10 was one of them and that by far and away is the lowest flow of all the office methods and it is my expectation that the MESOHabsim will be somewhere higher than 7Q10 and so for wastewater treatment plants discharge is usually, they are looking at 7Q10. I think the other issue, and I have no answer for this but I do know that we use tons of salt and as far as what Chloride does I know for the stormwater facility we are above the acute and the chronic levels by orders of magnitude for the entire country.

3:15 – 3:30 Other Business

Ken – I think in the interest of time we will have to cut off the questions and before we adjourn I think it is probably wise for us to at least target when our next meeting is. If I have the time line correct, from the first presentation the target date for the protected instream flow public hearing is sometime in March of 2006 and I am just trying to determine how this committee could be most effective whether it might make sense to trial run what is going to be presented to the public in front of this group before it goes to the public. It wasn't clear to me on Task 6 from the presentation whether the target date was to pull the public instream flow or to have the draft ready to go out to the public.

Tom – My vision, we just met last Friday, this is where we are thinking, January we should have the Task 5 report ready. We would meet and give that presentation and you would give us all your input, and there have been avenues for your input all the way along. So it should not come as a huge surprise to any one here and soon after that we should be able to have the full public hearing. I would imagine that the majority of the people at the full public hearing would be those in this room.

Wayne – The public hearing does require that we have the document ready 30 days in advance for people to review. So we would need to have whatever we are going to present to the public finalized 30 days before we present it at the public hearing. That would require us to have a firmly defined product at some point far enough in advance so that we can both publicize and have that document ready and be prepared for that public hearing. We need to get the results and review them on reasonable turnaround time, and have a couple of weeks or so, and have something final at the end of two or three weeks and be ready to put that out to the public and have that 30 day public review period. We have a mini review period that this committee will be primarily focused with.

Ken – Correct me if I am wrong, but that public hearing is in the watershed, like say Milford.

Wayne – That is true, it is a jointly held with the legislature which essentially means the Senate Environment Committee, and the RR&D and probably the Senate Bill 330 committee members will be the ones that are primarily involved, but I get the expectation that they will be the primary people that will be holding it jointly. The meeting will be held in the watershed so I will target the Milford Auditorium, or some place similar unless someone has some suggestions.

Ken – Wayne you are talking draft in January? **Wayne** – Yes, which would be the Task 5. **Ken** – Which means that if we met like 2 weeks after it got submitted so that we had a change to look at and give you the initial input. **Wayne** – The time is whatever you feel comfortable with. **Ken** – I suspect like most of us whether it is two or four weeks doesn't matter.

Ken – So we would be looking at the second week in February. Pick a tentative date now in February.

Tentative Date of Monday, February 13th, TRC Meeting at 9:30 am.

Knock down drag out, report is then issued to public say 10 days later so that would be the 23rd, and the public has 30 days to review before we have the public hearing so we are looking around the 2 or 3 week in March for the public hearing.

Conservation Water User Plans – When will those be forth coming?

Tom – If you look through my slides you will see June. June looks like reasonable time.

3:30 Meeting adjourns.

Motion was made by Alden Greenwood and seconded by John Nelson to adjourn meeting and the vote was unanimous.

Meeting adjourned at 4:04 pm.